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Software Testing – Foundation Level Exercises Proposal for solution

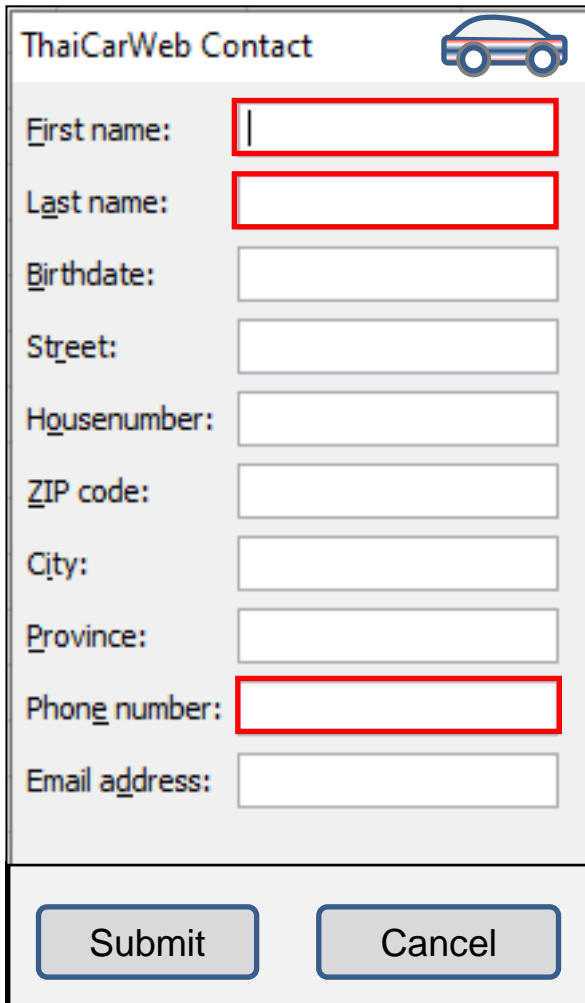
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Exercise 1. Review of a specification

Specification for contact module of “ThaiCarWeb”

The contact module allows for all interested user worldwide to enter fast and user friendly their contact data to get in contact with the ThaiCar company.



ThaiCarWeb Contact

First name:

Last name:

Birthdate:

Street:

Housenumber:

ZIP code:

City:

Province:

Phone number:

Email address:

Submit Cancel

The ThaiCarWeb Contact page and every related page of the contact module contain the “ThaiCar” logo.

The mandatory fields should be highlighted with a red frame.

Mandatory fields are:

1. First name
2. Last name
3. Phone number

The ZIP code can contain 5 digits.

First name and last name can contain up to 100 characters.

The birthdate is stored as date.

All other fields can contain up to 50 alphanumeric characters.

After the customer pressed the Submit button, ThaiCarWeb checks the entries. If all entries are okay, they will be transferred to the ThaiWeb database.

The email address entry is mandatory and must contain a ‘@’ character and at least 5 characters.

If the birthdate has not been entered, an error window pops up until the birthdate is entered. The

error window must contain the “ThaiCar” logo.

The transferred data will be mapped to corresponding attributes of the ThaiCarWeb database. Each could contain up to 50 alphanumeric characters. The TCWEB table contains:

TCWEB_CON_FIRSTNAME,	VARCHAR(50)	TCWEB_CON_ZIP CODE,	VARCHAR(50)
TCWEB_CON_MIDDLENAME,	VARCHAR(50)	TCWEB_CON_CITY,	VARCHAR(50)
TCWEB_CON_LASTNAME,	VARCHAR(50)	TCWEB_CON_PROVINCE,	VARCHAR(50)
TCWEB_CON_BIRTHDATE,	VARCHAR(50)	TCWEB_CON_PHONE NUMBER,	VARCHAR(50)
TCWEB_CON_STREET,	VARCHAR(50)	TCWEB_CON_EMAIL ADDRESS,	VARCHAR(50)
TCWEB_CON_HOUSENUMBER,	VARCHAR(50)		

Check the specification concerning inconsistencies, ambiguities, contradictions, omissions, inaccuracies, and redundancies.

Proposal for solution:

1. Inaccuracy

- a. "The contact module allows for all interested user worldwide to enter fast and user friendly their contact data"
- b. **Fast and user friendly** not defined: vague and open for interpretation

2. Omission

- a. "The contact module allows for all interested user worldwide to enter fast and user friendly their contact data to get in contact with the ThaiCar manufacturer."
- b. "**worldwide**", but no field "Country" is offered, neither in the GUI, nor in the database.

3. Redundant

- a. "The ThaiCarWeb Contact page and every related page of the contact module contain the "ThaiCar" logo."
- b. "The error window must contain the "ThaiCar" logo." → redundant

4. Contradiction

- a. Mandatory fields are:
 - First name
 - Last name
 - Phone number
- b. If the birthdate has not been entered, an error window pops up until the birthdate is entered
- c. The email address entry is mandatory and must contain a '@' character and at least 5 characters. Not highlighted in the screenshot.

5. Inconsistency

- a. First name and last name can contain up to 100 characters.
- b. TCWEB_CON_FIRSTNAME, VARCHAR(50)
TCWEB_CON_LASTNAME, VARCHAR(50)

6. Inconsistency

- a. The ZIP code can contain 5 numbers.
The birthdate is stored as date.
- b. TCWEB_CON_BIRTHDATE, VARCHAR(50)
TCWEB_CON_ZIP CODE, VARCHAR(50)

7. Omission

- a. No possibility to enter middle name
- b. TCWEB_CON_MIDDLENAME, VARCHAR(50)

8. Omission

It is not described what happens if the mandatory fields First name, Last name, and Phone number are not entered, and the customer clicks the Submit button.

9. Omission

It is not described what happens after the customer pressed the Cancel button.

10. Inconsistency

- a. If all entries are okay, they will be transferred to the **ThaiWeb database**.
- b. The transferred data will be mapped to corresponding attributes of the **ThaiCarWeb database**.

11. Omission

- a. "If the birthdate has not been entered, an error window pops up until the birthdate is entered."
- b. What is the message in the error window pops up?
Proposal: "Please enter the birthdate."

12. Omission

- a. "If the birthdate has not been entered, an error window pops up until the birthdate is entered."
- b. How does the system react, if there are no values entered for other mandatory entry fields?
Proposal: "An error window pops up until the value for a mandatory field is entered."

13. Inaccuracy

- a. "First name and last name can contain up to 100 characters."
- b. Both together get can contain up to 100 characters, or each?
Proposal: "First name can contain up to 100 characters and last name can contain up to 100 characters."

14. Possible further questions and proposals for improvements:

- a. The software should be used worldwide. Is it sufficient to consider only 5 characters for ZIP code?
In the US there is an expanded ZIP Code system that is called ZIP+4 with 10 characters like "22162-1010" (see https://en.wikipedia.org/wiki/ZIP_Code)
- b. "If all entries are okay,"
What are the rules? For example: ZIP code contains only digits.
First name: Which characters are allowed, what's up with ä, ö, ü, ß.
Are spaces allowed? Other special characters, Thai letters?
- c. The email address entry is mandatory and must contain a '@' character and at least 5 characters.
Is the limit correct? Proposal: 6 characters (x@y.zz)

Exercise 2. Equivalence Partitioning

ThaiCarWeb contains a used car module, offering used cars. The current stock in the test environment contains as test data 16 used cars.

1. 2009 ThaiCar 9 C, 60 hp, coupé, 4 doors, mileage: 350,000 km, ฿59,000,
2. 2008 ThaiCar 9 S, 95 hp, sedan, 4 doors, mileage: 189,000 km, ฿64,000,
3. 2006 ThaiCar 9 TLS, 95 hp, sedan, 3 doors, mileage: 270,000 km, ฿66,000,
4. 2009 ThaiCar 9 CL, 60 hp, coupé, 2 doors, mileage: 220,000 km, ฿89,000,
5. 2010 ThaiCar 9 T, 60 hp, hatchback, 5 doors, mileage: 177,000 km, ฿99,000,
6. 2012 ThaiCar 9, 60 hp, sedan, 2 doors, mileage: 65,000 km, ฿109,000,
7. 2014 ThaiCar 9 CS, 95 hp, coupé, 4 doors, mileage: 104,000 km, ฿159,000,
8. 2011 ThaiCar 9 TS, 95 hp, hatchback, 3 doors, mileage: 123,000 km, ฿200,000,
9. 2016 ThaiCar 9 L, 60 hp, sedan, 4 doors, mileage: 85,000 km, ฿253,000,
10. 2015 ThaiCar 9 TL, 60 hp, hatchback, 5 doors, mileage: 76,000 km, ฿289,000,
11. 2015 ThaiCar 9 S, 95 hp, sedan, 4 doors, mileage: 41,000 km, ฿320,000,
12. 2018 ThaiCar 9 T, 60 hp, hatchback, 3 doors, mileage: 34,000 km, ฿321,000,
13. 2017 ThaiCar 9 CL, 60 hp, coupé, 4 doors, mileage: 52,000 km, ฿322,000,
14. 2019 ThaiCar 9 LS, 95 hp, sedan, 4 doors, mileage: 13,000 km, ฿499,000,
15. 2019 ThaiCar 9 CLS, 95 hp, coupé, 2 doors, mileage: 1,000 km, ฿500,000,
16. 2019 ThaiCar 9 TLS, 95 hp, hatchback, 3 doors, mileage: 4,500 km, ฿609,000,

A financing module offers credits, if a customer would like to buy a used car. Credits are only offered, if the car costs ฿100,000 or more. The interest rate is 2.0 %, but there are some exceptions. If the car costs ฿200,000 or less, the interest rate is 4.5 %. If the car costs more than ฿200,000 but less than ฿321,000, the interest rate is 3.5 %.

For all cars that cost ฿500,000 or more, the interest rate is 0.5 %.

- a) How many tests must be executed for Equivalence Partitioning? See c)
- b) Define the partitions that should be tested. See c)
- c) Which test data would you use for testing?

Partition	Value	Interest rate	Test data
P1	$x < \text{฿}100,000$	No credit offered	1, 2, 3, 4, 5
P2	$\text{฿}100,000 \leq x \leq \text{฿}200,000$	4.5 %	6, 7, 8
P3	$\text{฿}200,000 < x < \text{฿}321,000$	3.5 %	9, 10, 11
P4	$\text{฿}321,000 \leq x < \text{฿}500,000$	2.0 %	12, 13, 14
P5	$x \geq \text{฿}500,000$	0.5 %	15, 16

d) Write the corresponding test cases.

Test Case ID/name	TCWeb-0201 Credit not offered		
Priority	major		
Description	Credit will not be offered, if a car costs less than ฿100,000		
Test steps	No.	Activity	Expected result
	10	Call Thai Car web site	Thai Car web site opens
	20	Choose "Used cars"	Used cars are presented
	30	Choose a used car that costs less than ฿100,000	Credit is not offered

Test Case ID/name	TCWeb-0202 Credit offered with an interest rate of 4.5 %		
Priority	critical		
Description	Credit will be offered with an interest rate of 4.5 %, if a car costs ฿100,000 or more and ฿200,000 or less		
Test steps	No.	Activity	Expected result
	10	Call Thai Car web site	Thai Car web site opens
	20	Choose "Used cars"	Used cars are presented
	30	Choose a used car that costs ฿100,000 or more and ฿200,000 or less	Credit is offered with an interest rate of 4.5 %

Test Case ID/name	TCWeb-0203 Credit offered with an interest rate of 3.5 %		
Priority	major		
Description	Credit will be offered with an interest rate of 3.5 %, if a car costs more than ฿200,000 or more and ฿320,000 or less		
Test steps	No.	Activity	Expected result
	10	Call Thai Car web site	Thai Car web site opens
	20	Choose "Used cars"	Used cars are presented
	30	Choose a used car that costs more than ฿200,000 or more and ฿320,000 or less	Credit is offered with an interest rate of 3.5 %

Test Case ID/name	TCWeb-0204 Credit offered with an interest rate of 2.0 %		
Priority	major		
Description	Credit will be offered with an interest rate of 2.0 %, if a car costs more than ฿320,000 and less than ฿500,000		
Test steps	No.	Activity	Expected result
	10	Call Thai Car web site	Thai Car web site opens
	20	Choose "Used cars"	Used cars are presented
	30	Choose a used car that costs more than ฿320,000 and less than ฿500,000	Credit is offered with an interest rate of 2.0 %

Test Case ID/name	TCWeb-0205 Credit offered with an interest rate of 0.5 %		
Priority	major		
Description	Credit will be offered with an interest rate of 0.5 %, if a car costs ฿500,000 or more		
Test steps	No.	Activity	Expected result
	10	Call Thai Car web site	Thai Car web site opens
	20	Choose "Used cars"	Used cars are presented
	30	Choose a used car that costs more than ฿320,000 and less than ฿500,000	Credit is offered with an interest rate of 0.5 %

Exercise 3. Boundary Value Analysis

Based on Exercise 2:

a) How many tests must be executed for Boundary Value Analysis?

Hints: Please consider for each partition class minimum and maximum value.

All prices are multiples of ฿1,000, this means every price is step up with ฿1,000.

For example there is no price possible like ฿99,999 or ฿105,550.

8 Tests

b) Which test data would you use for testing?

Partition	Value	Interest rate	Boundary values	Test data	to be added?
P1	$x < \text{฿}100,000$	No credit offered	฿99,000	5	
P2	$\text{฿}100,000 \leq x \leq \text{฿}200,000$	4.5 %	฿100,000		yes
			฿200,000	8	
P3	$\text{฿}200,000 < x < \text{฿}321,000$	3.5 %	฿201,000		yes
			฿320,000	11	
P4	$\text{฿}321,000 < x < \text{฿}500,000$	2.0 %	฿321,000	12	
			฿499,000	14	
P5	$x \geq \text{฿}500,000$	0.5 %	฿500,000	15	

c) Propose test data to be added.

17. 2011 ThaiCar 9, 60 hp, sedan, 2 doors, mileage: 81,000 km, ฿100,000,

18. 2012 ThaiCar 9 TS, 95 hp, hatchback, 5 doors, mileage: 134,000 km, ฿201,000,

d) Write all required additional test cases

5 test cases documented in Exercise 2, plus 3 more:

Test Case ID/name	TCWeb-0301 Credit offered with an interest rate of 4.5 % - lower boundary		
Priority	minor		
Description	Credit will be offered with an interest rate of 4.5 %, if a car costs ฿100,000 or more and ฿200,000 or less. Check lower boundary		
Test steps	No.	Activity	Test data
	10	Call Thai Car web site	Expected result
	20	Choose "Used cars"	Thai Car web site opens
	30	Choose a used car that costs ฿100,000	Used cars are presented
			17. 2011 ThaiCar 9, for ฿100,000
			Credit is offered with an interest rate of 4.5 %

Test Case ID/name	TCWeb-0302 Credit offered with an interest rate of 3.5 % - lower boundary		
Priority	minor		
Description	Credit will be offered with an interest rate of 3.5 %, if a car costs ฿201,000		
Test steps	No.	Activity	Test data
	10	Call Thai Car web site	Expected result
	20	Choose "Used cars"	Thai Car web site opens
	30	Choose a used car that costs ฿201,000	Used cars are presented
			18. 2012 ThaiCar 9 TS for ฿201,000
			Credit is offered with an interest rate of 3.5 %

Test Case ID/name	TCWeb-0303 Credit offered with an interest rate of 2.0 % - upper boundary		
Priority	minor		
Description	Credit will be offered with an interest rate of 2.0 %, if a car costs ฿499,000		
Test steps	No.	Activity	Test data
	10	Call Thai Car web site	Expected result
	20	Choose "Used cars"	Thai Car web site opens
	30	Choose a used car that costs ฿499,000	Used cars are presented
			14. 2019 ThaiCar 9 LS for ฿499,000
			Credit is offered with an interest rate of 2.0 %

Exercise 4. Decision Table Testing

ThaiCarWeb contains a configuration module, for a new **ThaiCar 9**. A user could configure a **ThaiCar 9** and gets finally – after the configuration is finished – the price.

ThaiCar 9 is offered with either a basic engine with 60 horse power, or with a sport version with 95 horse power. The basic price is ฿495,000, the basic price for the sport version

ThaiCar 9 S (S is added at the end of the type name) is ฿545,000.

The car body is available in three variants: sedan, coupé, or hatchback, where the sedan version is standard. The extra charge compared to the sedan version for the coupé version is ฿40,000, the extra charge compared to the sedan version for the hatchback version is ฿85,000. The Coupé type name starts with 'C', like for example **ThaiCar 9 C** or **ThaiCar 9 CS**.

The hatchback type name starts with 'T', like for example **ThaiCar 9 T** or **ThaiCar 9 TS**.

Every **ThaiCar 9** has 2 doors (sedan, coupé) or rather 3 doors (hatchback) as standard equipment. 2 more doors could be ordered for ฿35,000.

Luxury equipment for every **ThaiCar 9** could be ordered for ฿100,000. To be able to recognize the luxury version, in the type name 'L' is listed, for example **ThaiCar 9 CL** or **ThaiCar 9 TLS**.

- Crane a decision table for all combinations. How many combinations are possible?
- How much costs the cheapest, and how much costs the most expensive version of **ThaiCar 9**?

ThaiCar 9			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Conditions	Engine (horsepower)		60	60	60	60	60	60	60	60	60	60	60	60	95	95	95	95	95	95	95	95	95	95	95	95
	Luxury		0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Body (Sedan, Coupé, Hatchback)		S	S	C	C	H	H	S	S	C	C	H	H	S	S	C	C	H	H	S	S	C	C	H	H
	Doors		2	4	2	4	3	5	2	4	2	4	3	5	2	4	2	4	3	5	2	4	2	4	3	5
Actions	Basic price	฿495,000	x	x	x	x	x	x	x	x	x	x	x	x												
	S Basic price sport version	฿545,000													x	x	x	x	x	x	x	x	x	x	x	x
	L Luxury equipment +	฿100,000							x	x	x	x	x	x							x	x	x	x	x	x
	C Coupé extra charge +	฿40,000			x	x					x	x					x	x					x	x		
	T Hatchback extra charge +	฿85,000					x	x					x	x					x	x					x	x
	2 more doors extra charge +	฿35,000		x		x		x		x		x		x		x		x		x		x		x		x
			฿495,000	฿530,000	฿535,000	฿570,000	฿580,000	฿615,000	฿595,000	฿630,000	฿635,000	฿670,000	฿680,000	฿715,000	฿545,000	฿580,000	฿585,000	฿620,000	฿630,000	฿665,000	฿645,000	฿680,000	฿685,000	฿720,000	฿730,000	฿765,000
	Total price																									
	Type name	ThaiCar 9			C	C	T	T	L	L	CL	CL	TL	TL	S	S	CS	CS	TS	TS	LS	LS	CLS	CLS	TLS	TLS

The management decided to offer the **ThaiCar 9** coupé version only with 2 doors, and only with luxury equipment.

- c) What are the consequences concerning the decision table created?
How many combinations are possible now?

ThaiCar 9			1	2			3	4	5	6	7		8	9	10	11			12	13	14	15	16		17	18	
Conditions	Engine (horsepower)		60	60	60	60	60	60	60	60	60	60	60	60	95	95	95	95	95	95	95	95	95	95	95	95	95
	Luxury		0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1
	Body (Sedan, Coupé, Hatchback)		S	S	C	C	H	H	S	S	C	C	H	H	S	S	C	C	H	H	S	S	C	C	H	H	H
	Doors		2	4	2	4	3	5	2	4	2	4	3	5	2	4	2	4	3	5	2	4	2	4	3	5	5
Actions	Basic price	฿495,000	x	x	*	*	x	x	x	x	x	*	x	x													
	S Basic price sport version	฿545,000													x	x	*	*	x	x	x	x	x	*	x	x	x
	L Luxury equipment +	฿100,000							x	x		x	*	x	x						x	x	x	*	x	x	x
	C Coupé extra charge +	฿40,000			*	*						x	*				*	*					x	*			
	T Hatchback extra charge +	฿85,000					x	x						x	x				x	x					x	x	x
	2 more doors extra charge +	฿35,000		x		*		x		x		*		x		x		*		x		x		*		x	x
	Total price		฿495,000	฿530,000	฿535,000	฿570,000	฿580,000	฿615,000	฿595,000	฿630,000	฿635,000	฿670,000	฿680,000	฿715,000	฿545,000	฿580,000	฿595,000	฿620,000	฿630,000	฿665,000	฿645,000	฿680,000	฿685,000	฿720,000	฿730,000	฿765,000	฿765,000
	Type name	ThaiCar 9			C	C	T	T	L	L	CL	CL	TL	TL	S	S	CS	CS	TS	TS	LS	LS	CLS	CLS	TLS	TLS	TLS

The management decided to promote the hatchback versions of **ThaiCar 9**: for a price for ฿555.000. Every hatchback version gets without extra charge the luxury equipment, sport version engine with 95 horse power, and 5 doors.

- d) What are the consequences concerning the decision table created?
How many combinations are possible now?

ThaiCar 9			1	2	3	4	5	6	7	8	9	10	11
Conditions	Engine (horsepower)		60	60	60	60	60	95	95	95	95	95	95
	Luxury		0	0	1	1	1	0	0	1	1	1	1
	Body (Sedan, Coupé, Hatchback)		S	S	S	S	C	S	S	S	S	C	H
	Doors		2	4	2	4	2	2	4	2	4	2	5
Actions	Basic price	฿495,000	x	x	x	x	x						
S	Basic price sport version	฿545,000						x	x	x	x	x	x
L	Luxury equipment +	฿100,000			x	x	x			x	x	x	x
C	Coupé extra charge +	฿40,000					x					x	
T	Hatchback extra charge +	฿85,000											x
	2 more doors extra charge +	฿35,000		x		x			x		x		x
	Total price		฿495,000	฿530,000	฿595,000	฿630,000	฿635,000	฿545,000	฿580,000	฿645,000	฿680,000	฿685,000	฿555,000
	Type name	ThaiCar 9			L	L	CL	S	S	LS	LS	CLS	TLS

- e) List test cases with headlines for the decision table created with task d). Assign priorities to the test cases, either “critical”, “major”, or “minor”.

ThaiCar 9		1	2	3	4	5	6	7	8	9	10	11
Conditions	Engine (horsepower)	60	60	60	60	60	95	95	95	95	95	95
	Luxury	0	0	1	1	1	0	0	1	1	1	1
	Body (Sedan, Coupé, Hatchback)	S	S	S	S	C	S	S	S	S	C	H
	Doors	2	4	2	4	2	2	4	2	4	2	5
Actions	Basic price	฿495,000	x	x	x	x						
	S Basic price sport version	฿545,000					x	x	x	x	x	x
	L Luxury equipment +	฿100,000			x	x			x	x	x	x
	C Coupé extra charge +	฿40,000				x					x	
	T Hatchback extra charge +	฿85,000										x
	2 more doors extra charge +	฿35,000		x				x		x		x
			฿495,000	฿530,000	฿595,000	฿630,000	฿635,000	฿545,000	฿580,000	฿645,000	฿680,000	฿685,000
	Total price		฿495,000	฿530,000	฿595,000	฿630,000	฿635,000	฿545,000	฿580,000	฿645,000	฿680,000	฿685,000
	Type name	ThaiCar 9		L	L	CL	S	S	LS	LS	CLS	TLS
	Priority		critical	minor	major	minor	major	minor	major	minor	minor	major
			critical	minor	major	minor	major	minor	major	minor	minor	major

Test Case ID/name	TCWeb-0401 ThaiCar 9 2-door	
Priority	critical	
Description	Configure ThaiCar 9 2-door, price should be ฿495,000	
Test steps	No. Activity	Expected result
	10 Call Thai Car web site	Thai Car web site opens
	20 Choose ThaiCar 9	Thai Car 9 is chosen
	30 Choose "Configure car"	Configure modul is opened
	40 Choose body "Sedan"	
	50 Choose basic engine	
	60 Choose no luxury equipment	
	70 Choose 2 doors	ThaiCar 9 2-door is configured
	80 Check price	Price ฿495,000 is shown

Test Case ID/name	TCWeb-0402 ThaiCar 9 4-door	
Priority	minor	
Description	Configure ThaiCar 9 4-door, price should be ฿530,000	
Test steps	No. Activity	Expected result
	10 Call Thai Car web site	Thai Car web site opens
	20 Choose ThaiCar 9	Thai Car 9 is chosen
	30 Choose "Configure car"	Configure modul is opened
	40 Choose body "Sedan"	
	50 Choose basic engine	
	60 Choose no luxury equipment	
	70 Choose 4 doors	ThaiCar 9 4-door is configured
	80 Check price	Price ฿530,000 is shown

Test Case ID/name	TCWeb-0403 ThaiCar 9 L 2-door	
Priority	major	
Description	Configure ThaiCar 9 L 2-door, price should be ฿595,000	
Test steps	No. Activity	Expected result
	10 Call Thai Car web site	Thai Car web site opens
	20 Choose ThaiCar 9	Thai Car 9 is chosen
	30 Choose "Configure car"	Configure modul is opened
	40 Choose body "Sedan"	
	50 Choose basic engine	
	60 Choose luxury equipment	
	70 Choose 2 doors	ThaiCar 9 L 2-door is configured
	80 Check price	Price ฿595,000 is shown

Test Case ID/name	TCWeb-0404 ThaiCar 9 L 4-door	
Priority	minor	
Test steps	No. Activity	Expected result
	10 Call Thai Car web site	Thai Car web site opens
	20 Choose ThaiCar 9	Thai Car 9 is chosen
	30 Choose "Configure car"	Configure modul is opened
	40 Choose body "Sedan"	
	50 Choose basic engine	
	60 Choose luxury equipment	
	70 Choose 4 doors	ThaiCar 9 L 4-door is configured
	80 Check price	Price ฿630,000 is shown

Test Case ID/name	TCWeb-0405 ThaiCar 9 CL 2-door	
Priority	major	Checking coupé
Description	Configure ThaiCar 9 CL 2-door, price should be ฿635,000	
Test steps	No. Activity	Expected result
	10 Call Thai Car web site	Thai Car web site opens
	20 Choose ThaiCar 9	Thai Car 9 is chosen
	30 Choose "Configure car"	Configure modul is opened
	40 Choose body "Coupé"	
	50 Choose basic engine	
	60 Choose luxury equipment	
	70 Try to choose 4 doors	It is not possible to choose 4 doors
	80 Choose 2 doors	ThaiCar 9 CL 2-door is configured
	90 Check price	Price ฿635,000 is shown

Test Case ID/name	TCWeb-0406 ThaiCar 9 S 2-door	
Priority	minor	
Description	Configure ThaiCar 9 S 2-door, price should be ฿545,000	
Test steps	No. Activity	Expected result
	10 Call Thai Car web site	Thai Car web site opens
	20 Choose ThaiCar 9	Thai Car 9 is chosen
	30 Choose "Configure car"	Configure modul is opened
	40 Choose body "Sedan"	
	50 Choose sport version	
	60 Choose no luxury equipment	
	70 Choose 2 doors	ThaiCar 9 S 2-door is configured
	80 Check price	Price ฿545,000 is shown

Test Case ID/name	TCWeb-0407 ThaiCar 9 S 4-door	
Priority	major	Combination sport engine/4 doors
Description	Configure ThaiCar 9 S 4-door, price should be ฿580,000	
Test steps	No. Activity	Expected result
	10 Call Thai Car web site	Thai Car web site opens
	20 Choose ThaiCar 9	Thai Car 9 is chosen
	30 Choose "Configure car"	Configure modul is opened
	40 Choose body "Sedan"	
	50 Choose sport version	
	60 Choose no luxury equipment	
	70 Choose 4 doors	ThaiCar 9 S 4-door is configured
	80 Check price	Price ฿580,000 is shown

Test Case ID/name	TCWeb-0408 ThaiCar 9 LS 2-door	
Priority	minor	
Description	Configure ThaiCar 9 LS 2-door, price should be ฿645,000	
Test steps	No. Activity	Expected result
	10 Call Thai Car web site	Thai Car web site opens
	20 Choose ThaiCar 9	Thai Car 9 is chosen
	30 Choose "Configure car"	Configure modul is opened
	40 Choose body "Sedan"	
	50 Choose sport version	
	60 Choose luxury equipment	
	70 Choose 2 doors	ThaiCar 9 LS 2-door is configured
	80 Check price	Price ฿645,000 is shown

Test Case ID/name	TCWeb-0409 ThaiCar 9 LS 4-door	
Priority	minor	
Description	Configure ThaiCar 9 LS 4-door, price should be ฿680,000	
Test steps	No. Activity	Expected result
	10 Call Thai Car web site	Thai Car web site opens
	20 Choose ThaiCar 9	Thai Car 9 is chosen
	30 Choose "Configure car"	Configure modul is opened
	40 Choose body "Sedan"	
	50 Choose sport version	
	60 Choose luxury equipment	
	70 Choose 4 doors	ThaiCar 9 LS 4-door is configured
	80 Check price	Price ฿580,000 is shown

Test Case ID/name	TCWeb-0410 ThaiCar 9 CLS 2-door	
Priority	major	
Description	Configure ThaiCar 9 CLS 2-door, price should be ฿685,000	
Test steps	No. Activity	Expected result
	10 Call Thai Car web site	Thai Car web site opens
	20 Choose ThaiCar 9	Thai Car 9 is chosen
	30 Choose "Configure car"	Configure modul is opened
	40 Choose body "Coupé"	
	50 Choose sport version	
	60 Choose luxury equipment	
	70 Try to choose 4 doors	It is not possible to choose 4 doors
	80 Choose 2 doors	ThaiCar 9 CLS 2-door is configured
	90 Check price	Price ฿685,000 is shown

Test Case ID/name	TCWeb-0411 ThaiCar 9 TLS 5-door	
Priority	critical	
Description	Configure ThaiCar 9 TLS 5-door, price should be ฿555,000	
Test steps	No. Activity	Expected result
	10 Call Thai Car web site	Thai Car web site opens
	20 Choose ThaiCar 9	Thai Car 9 is chosen
	30 Choose "Configure car"	Configure modul is opened
	40 Choose body "Hatchback"	
	50 Try to choose basic engine	It is not possible to choose basic engine
	60 Choose sport version	
	70 Try to choose no luxury equipment	It is not possible to choose no luxury equipment
	80 Choose luxury equipment	
	90 Try to choose 3 doors	It is not possible to choose 3 doors
	100 Choose 5 doors	ThaiCar 9 TLS 5-door is configured
	110 Check price	Price ฿555,000 is shown

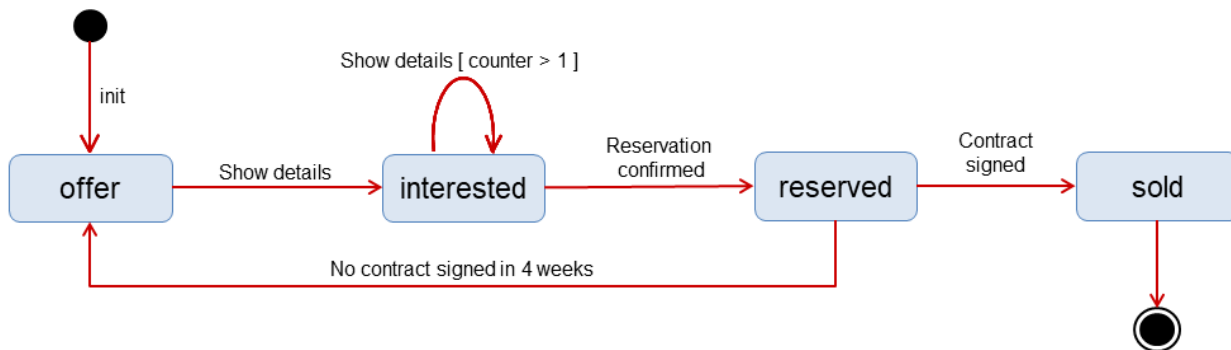
Exercise 5. State Transition Testing

Specification:

ThaiCarWeb contains a used car module, offering used cars. The initial state of a used car is “offer”. If a user is interested in a specific used car, he can click on it, and a detail page opens showing all details for the selected car. The car gets the state “interested”, including a counter, counting how often any user opened the detail page.

The detail page offers a “Reservation” button, where a user could reserve a car. After clicking the button, another page opens, where the user could enter his contact data and confirm the reservation. After confirmation the car gets the state “reserved”. If a user signs a contract with the related dealer to buy the car, the dealer updates the state of the car to “sold”. If there is no contract signed in 4 weeks, the reservation gets cancelled and the car gets the initial state again.

a) Create a state diagram based on the information in the specification.



b) How many test cases should be created? Describe for all test cases the headline and a short description.

Test Case ID/name	TCWeb-0501 Buy used car - Complete scenario
Priority	critical
Description	Buy a used car - complete scenario: Choose specific car, reserve car and confirm, buy car

Test Case ID/name	TCWeb-0502 Buy used car - Cancel reservation
Priority	major
Description	A user reserves a used car. No contract has been signed in 4 weeks. The state of the car changes from "reserved" back to "offer"

Test Case ID	TCWeb-0503 Buy used car - Check counter
Priority	minor
Description	2 different user click on a used car to see the details. Value of counter related to state "interested" is 2

- c) Determine which of the identified test cases to be created should get the highest priority. Add for this test case the required test steps.

Test Case ID/name	TCWeb-0501 Buy used car - Complete scenario			
Priority	critical			
Description	Buy a used car - complete scenario: Choose specific car, reserve car and confirm, buy car			
Test steps	No.	Activity	Test data	Expected result
	10	Call Thai Car web site		Thai Car web site opens
	20	Choose "Used cars"		Used cars are presented
	30	Check state of specific used car	2019 ThaiCar 9 TLS	State is "offer"
				Detail page opens, showing all
	40	Click on specific used car	2019 ThaiCar 9 TLS	details for the selected car
	50	Check state of specific used car	2019 ThaiCar 9 TLS	State is "interested"
	60	Check counter of specific used car	2019 ThaiCar 9 TLS	Counter = 1
				page opens, where the user could
	70	Click on "Reservation" button	2019 ThaiCar 9 TLS	enter his contact data and confirm
	80	Enter contact data and confirm the reservation	2019 ThaiCar 9 TLS	the reservation
	90	Check state of specific used car	2019 ThaiCar 9 TLS	Car is reserved
100	Dealer updates the state of the car to "sold".	2019 ThaiCar 9 TLS	State is "reserved"	
110	Check state of specific used car	2019 ThaiCar 9 TLS	Car is sold	
			State is "sold"	

Exercise 6. Use Case Testing

User Story: CC001: As a buyer of a “Thai Car” I want to pay with credit card.

Description:

Precondition is that the user has chosen a “Thai Car” to buy and already entered his contact data (see *specification for contact module of “ThaiCarWeb”*).

After the user clicked on a radio button “Want to buy with credit card”, a “credit card payment” side opens and the user may chose the credit card he would like to use.

It is expected that about 80 % of all buyers will use the “Thai Extend” credit card. Credit cards from “MainCard” and “SuperCisa” will be accepted as well.

After the user has chosen the type of credit card he enters his name. Then, he enters his credit card information: the credit card number, expiration date, and security code.

Finally the user clicks the [Buy now] button. A confirmation page opens, additionally a confirmation email is sent.

Acceptance criteria:

1. A user can buy a car with a credit card from “MainCard”, “SuperCisa” or “Thai Extend”.
2. An error message appears, if there is an issue with the credit card like wrong credit card number, expire date not correct, wrong security number, or credit not confirmed by credit card company.
3. System documentation is updated.

Tasks:

- a) How many test cases should be created? Describe for all test cases the headline and a short description.

Test Case ID/name	TCWeb-0601 Buy with "ThaiExtend" credit card
Priority	critical
Description	Buy a “Thai Car” with "ThaiExtend" credit card
Precondition	1. User has chosen a car to buy 2. User has already entered his contact data

Test Case ID/name	TCWeb-0602 Buy with "MainCard" credit card
Priority	major
Description	Buy a “Thai Car” with "MainCard" credit card
Precondition	1. user has chosen a car to buy 2. user has already entered his contact data

Test Case ID/name	TCWeb-0603 Buy with "SuperCisa" credit card
Priority	major
Description	Buy a “Thai Car” with "SuperCisa" credit card
Precondition	1. user has chosen a car to buy 2. user has already entered his contact data

Test Case ID/name	TCWeb-0604 Buy with credit card - Check error messages
Priority	major
Description	Buy a "Thai Car" with a credit card, do some errors like 1. wrong credit card number, 2. expire date not correct, 3. wrong security number Check error messages
Precondition	1. user has chosen a car to buy 2. user has already entered his contact data

Test Case ID/name	TCWeb-0605 Buy with credit card - Credit not confirmed
Priority	major
Description	Buy a "Thai Car" with a credit card, credit company informs that credit is not confirmed Check error message
Precondition	1. user has chosen a car to buy 2. user has already entered his contact data

Test Case ID/name	TCWeb-0606 Buy with credit card - Check system documentation
Priority	minor
Description	Check if system documentation has been updated

- b) Determine which of the identified test cases to be created should get the highest priority "critical". Add for this test case the required test steps.

Test Case ID/name	TCWeb-0601 Buy with "ThaiExtend" credit card			
Priority	critical			
Description	Buy a “Thai Car” with "ThaiExtend" credit card			
Precondition	1. User has chosen a car to buy 2. User has already entered his contact data			
Postcondition	./.			
Links	./.			
Test steps	No.	Activity	Test data	Expected result
	10	User clicks on radio button “Want to buy with credit card”	"ThaiExtend" credit card	"credit card payment" side opens
	20	User chooses credit card		User can enter following data
	30	User enters name		Name accepted
	40	User enters his credit card number		Credit card number accepted
	50	User enters expiration date		Expiration date accepted
	60	User enters security code		Security code accepted
	70	User clicks the [Buy now] button.		Confirmation page opens
	80	Check if confirmation email has been sent		Confirmation email has been sent

Exercise 7. Regression Testing

After refactoring **ThaiCarWeb**, regression tests should be executed to ensure that the application is still working as before. The regression tests should cover test cases of the areas.

1. Financing module (Exercises 2 and 3)
2. Configure module (Exercise 4)
3. Buy used car module (Exercise 5)
4. CreditCard module (Exercise 6)

There is a capacity of 10 test cases to be executed. The management asked for advice, when you could give a first impression of the quality of the system.

- a) Write a test execution schedule. Which test cases would you propose to execute for a regression test in which order? Which priority you would assign? Please explain.

Criteria:

- * All modules should be covered
- * All critical test cases should be covered.
- * Most important variants should be covered.

Proposal:

1. TCWeb-0202 Credit offered with an interest rate of 4.5 % (critical)
2. TCWeb-0411 ThaiCar 9 TLS 5-door (critical)
3. TCWeb-0501 Buy used car - Complete scenario (critical)
4. TCWeb-0601 Buy of a "Thai Car" with "ThaiExtend" credit card (critical)
5. TCWeb-0203 Credit offered with an interest rate of 3.5 % (major)
6. TCWeb-0204 Credit offered with an interest rate of 2.0 % (major)
7. TCWeb-0205 Credit offered with an interest rate of 0.5 % (major)
8. TCWeb-0401 ThaiCar 9 2-door (major) */* Not critical related to regression */*
9. TCWeb-0410 ThaiCar 9 CLS 2-door (major)
10. TCWeb-0201 Credit not offered (major)

- b) After execution of which test cases would you give a feedback to the management of a first impression?

After the execution of the 4 critical test cases a feedback to the management could be given, as all modules have been tested.

Exercise 8. Defect Management

After delivery of **ThaiCarWeb** v2.1 by the lead of development, Mr. Pan Flee, testing started on 16.02.2020. Two failures were reported by business users.

1. Mr. Joe Tom

With ThaiExtend no paying is possible no more!

Data:

Ben Thai-Tester"

Credit card number "4716 3445 6991 1778"

Expiration date 11/2024 was not accepted! No more proceeding!

Who developed such ☹️&☹️\$! Software??

Screenshot1.jpg and Screenshot2.jpg are attached.

2. Mrs. Noo Yang

The developers did a wrong deployment! It is still the old code! When configuring our famous ThaiCar 9 GTS it still shows the standard price, and not the offer of ฿555,000. I do not understand how this could be possible.

Screenshot3.jpg and Screenshot4.jpg are attached.

a) Write formal defect reports for the reported failures.

Defect ID	TCWeb-0701
Defect headline	Buy of a "Thai Car" with "ThaiExtend" credit card not possible
Priority	critical
Status	New
Reported:	16.02.2020 09:53
Modified	16.02.2020 14:21
Reported by:	Joe Tom
Assigned to	Pan Flee
Version	TCWeb-2020, v2.1
Component	CreditCard module
Attachments	Screenshot1.jpg Screenshot2.jpg
Links	Test case TCWeb-0601 Buy with "ThaiExtend" credit card
Description	<div> <div></div> <div> <p>Preconditions:</p> <ul style="list-style-type: none"> a New ThaiCar 9 TLS has been chosen to buy b Contact data for Ben Thai-Tester have been entered. <p>Steps to reproduce</p> <ol style="list-style-type: none"> 1 Click on radio button "Want to buy with credit card" 2 Choose credit card "ThaiExtend" 3 Enter user name "Ben Thai-Tester" 4 Enter credit card number "4716 3445 6991 1778" <p>Expected behavior:</p> <ul style="list-style-type: none"> Expiration date 11/2024 could be entered <p>Actual behavior:</p> <ul style="list-style-type: none"> After the expiration date has been entered, the entry field gets cleared, and no further proceeding is possible. </div> </div>

Defect ID	TCWeb-0702
Defect headline	Wrong price for ThaiCar 9 TLS 5-door
Priority	major
Status	New
Reported:	16.02.2020 10:24
Modified	16.02.2020 14:24
Reported by:	Noo Yang
Assigned to	Pan Flee
Version	TCWeb-2020, v2.1
Component	Configuration module
Attachments	Screenshot3.jpg Screenshot4.jpg
Links	Test case TCWeb-0411 ThaiCar 9 TLS 5-door
Description	
	Preconditions:
	./.
	Steps to reproduce
	1 Choose ThaiCar 9 to configure; configure module opens
	2 Choose hatchback
	3 Choose sport version
	4 Choose luxury equipment
	5 Choose 5 doors
	6 ThaiCar 9 TLS 5-door has been configured
	Expected behavior:
	Price is ฿555,000.
	Actual behavior:
	Price is ฿765,000.